UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,875	07/10/2003	Andreas Molisch	MH-5144	1554

7590   09/05/2006

Patent Department
Mitsubishi Electric Research Laboratories, Inc.
201 Broadway
Cambridge, MA   02139

EXAMINER
VLAHOS, SOPHIA

ART UNIT	PAPER NUMBER
2611	

DATE MAILED: 09/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 10/616,875	Applicant(s) MOLISCH ET AL.	
	Examiner SOPHIA VLAHOS	Art Unit 2611	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 July 2003*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 July 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Drawings

1.   The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "estimation of equalizer coefficients from the estimate of the channel impulse response" of claim 5 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2.   The abstract of the disclosure is objected to because of the following: In the

"Brief Description of the Drawings" section of the specification (pages 5-6 and

paragraphs [020]-[027]) there is no description of Figure 8. Correction is required. See

MPEP § 608.01(b).

Claim Objections

3.   Claim1 is objected to because of the following informalities: line 8 of claim 1

recites: "from the plurality of sample of the plurality...", this should be "from the plurality

of samples of the plurality...".

Claim 9, line 1 recites: "generates k sample", this should be "generates k

samples". Appropriate correction is required.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed
> publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5.   Claims 1, 4, 6, 7 are rejected under 35 U.S.C. 102(a) as being anticipated by

Banister (U.S. 6,456,647).

With respect to claim 1, receiving a plurality of training sequences modulated at a chip rate (column 6, lines 57-61, where the DS-CDMA "fingers" are used for each user 0, 1, m-1 as shown in Fig. 1, and it is understood that each user signal contains a pilot sequence, see also column 12, lines 33-38, where $p_i[n]$ corresponds to the ith user pilot signal, with respect to the modulation of the training sequences at a chip rate, see column 12, lines 9-18 it is mentioned that the pilot signal is "code multiplexed", and this is interpreted as the pilot signal being spread by a spreading code (used in CDMA) that has a chip rate); sampling each training sequence in parallel with, multiple correlators at sampling rate substantially slower than the chip rate (see Fig. 2, details of each finger, and Fig. 1 for parallel finger structure) to obtain a plurality of samples for each training sequence (see column 13, lines 13-16, where the symbol, rate is a fraction of the chip rate, and column 13, lines 61-64, and column 14, lines 1-15 where the multiple multipliers/despreaders (correlators) (elements 16n of Fig. 1) process (sample) at a rate slower than the chip rate, the plurality of samples for each training sequence is obtained by the plurality of multipliers (only two are shown in Fig. 1) for each user); and estimating the channel over a time interval of the impulse response from the plurality of sample of the plurality of sequences at a resolution substantially equal to the chip rate (see Fig. 2, combination of elements 26, 22,30, 32 that generate the channel (impulse response) coefficients, for each finger, see column 6, lines 56-61, with respect to the part "at a resolution substantially equal to the chip rate" this is anticipated by column 14, lines 19-22 where the estimation of the channel by the weights is good, (when the weights were produced when processing sample rate is reduced to the symbol rate)).

With respect to claim 4, all of the limitations of claim 4, are analyzed above in claim 1, (sampling rate is equal to a symbol rate).

With respect to claim 6, all of the limitations of claim 6 are analyzed above in claim 1, and Banister discloses: estimating weights for the corresponding correlators (see Fig. 2, details of finger, component 32 , weight w_i essentially and estimate of the channel response , see column 14, 2nd equation the symbol estimate, and lines 19-22,) to acquire most of the available energy of a data signal received via the estimated channel (it is understood that the weights are an estimate of the channel response (i.e. the medium between the DS-CDMA transmitter and receiver), and the degradation it causes has to be undone in the receiver for the received data sequences which results into acquiring most of the energy of the data signal received that has passed through the channel.

With respect to claim 7, all of the limitations of claim 7 are analyzed above in claim 1, and Banister discloses: in which a first subset of the samples are for a rough estimate, and a second subset of the samples are used for an accurate estimate based on the rough estimate (see column 12, lines 33-45, equation for wi includes zi and zi is a summation over k and can be considered as adding partial values (rough estimate) to obtain the accurate (complete) estimate).

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

7.   Claim 2, 3, 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Banister (U.S. 6,456,647).

With respect to claim 2, all of the limitations of claim 2, are analyzed above in

claim 1, except for: in which each training sequence is passed through n correlators to

generate n samples for each correlator. At the time of the invention, it would have been

obvious to a person of ordinary skill in the art that the above limitation is a matter of

design choice (system performance and available hardware requirements) of the

system. Therefore, in the system of Banister, functioning at a symbol rate (1/K times

the chip rate) and having plurality of fingers (see column 5, lines 26-28) it would have

been obvious to a person of ordinary skill in the art to have each training sequence pass

through n correlators to generate n samples depending on the available hardware,

(relating to the system size and power consumption) and performance tradeoff (a

system having fewer correlators generating fewer samples would be less accurate but

cheaper to put together, compared to using a greater number of correlators generating

more samples).

With respect to claim 3, all of the limitations of claim 3, are analyzed above in

claim 1, except for: which the sampling rate is at least ten times slower than the chip

rate. Although the above is not expressly disclosed by Banister, it would have been obvious to a person of ordinary skill that in the system of Banister, the sample rate being equal to 1/K the chip rate where there are the K chips per symbol, (understood to range from 1 to 128 in CDMA), to have a sampling rate at least ten times slower than the chip rate, because the system functioning at a lower symbol rate would reduce hardware requirements (see Banister, column 2, lines 28-30).

With respect to claim 8, all of the limitations of claim 8, are analyzed above in claim 1, except for: in which the estimate is based on a previous estimate of the channel impulse response. At the time of the invention, it would have been obvious to a person of ordinary skill in the art that this would be the case in the system of Banister if the channel is assumed to be static, and in this case it would have been obvious to a person of ordinary skill in the art that the previous channel impulse response would be the same as the current impulse response reading onto the limitation "in which the estimate is based on a previous estimate of the channel impulse response".

With respect to claim 9, all of the limitations of claim 9, are analyzed above in claim 1, and claim 9 is analyzed above in claim 2.

8.   Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Banister (U.S. 6,456,647) in view of Rademacher (U.S. 6,570,918).

With respect to claim 5, all of the limitations of claim 5 are analyzed above in claim 1, except for: estimating equalizer coefficients from the estimate of the channel impulse response. In the same field of endeavor, Rademacher discloses: estimating equalizer coefficients from the estimate of the channel impulse response (see Fig. 3, element 22, "preequalizer", element 28, "receiver controller", column 2, lines 63-67, column 4, lines 32-38, column 7, lines 30-35, see column 9, lines 1-39, where v, w vectors are jointly optimized in equation (1). At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the equalizer of Rademacher in the system of Banister so that the equalizer mitigates at least a portion of an intersymbol interference present in the spread spectrum signals (Rademacher, column 2, lines 63-67).

Conclusion

9.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ghosh (U.S. 2002/0191568) discloses: a DS-CDMA using a plurality of pilot signals used for continuous equalizer adaptation.

Namgoong "A channelized DSSS Ultra-Wideband Receiver" IEEE 2001, discloses a

UWB DS-CDMA parallel receiver architecture that samples the received signals at a

fraction of a chip rate.

Wang et. al. (U.S. 6,266,365) discloses a CDMA receiver having a parallel correlator

structure using a reduced sampling clock rate.

Carbone et. al., (U.S. 6,856,646) disclose: a rake receiver including equalizers and

correlators for respective rake fingers.

Ylitalo et. al. (U.S. 6,215,814) disclose: a rake receiver using weighting coefficients

derived from channel estimates to scale received signals in rake fingers.

Contact Information

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to SOPHIA VLAHOS whose telephone number is 571 272

5507. The examiner can normally be reached on MTWRF 8:30-17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mohammed Ghayour can be reached on 571 272 3021. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SV
8/31/06

MOHAMMED GHAYOUR
SUPERVISORY PATENT